CLIMATE INFORMATION FOR MANAGING RISK THROUGH AGRICULTURAL LAND AND MACHINERY CONTRACTUAL ARRANGEMENTS

Interim Progress Report

(June 1, 2004-February 28, 2005)

HUMAN DIMENSIONS OF GLOBAL CHANGE RESEARCH PROGRAM
CLIMATE AND GLOBAL CHANGE PROGRAM
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

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I. PRELIMINARY MATERIALS

A. Project Abstract

This proposal addresses the NOAA-OGP-HDGCR Program's number (1) priority for FY04 funding, which involves a new focus on "*how society can better adapt to climate variability and change*" (termed *adaptation*). A potential mechanism to manage the adverse and beneficial effects of climate variability on agricultural production through "adaptation" is use of innovative contractual arrangements for capital investments (land and machinery) throughout the U.S. and elsewhere. This opportunity arose from informal discussions with members of the Association of Agricultural Production Executives (AAPEX), a 500-member group whose international operations produce 2.5 percent of the total U.S. agricultural output. Here, we will examine the potential for application of knowledge of regional climate variability obtained from analyses of historical data to resource allocation decisions for land and machinery to manage risk in unique contractual arrangements between various regions in the U.S., and other regions worldwide. Consistent with the HDGCR's Program Announcement Sheet FY 2004 "*the results of this research should be able to provide decision makers within the regions under study information and/or tools to further existing strategies*."

The methodology proposed to address the above issues consists of several related general steps. First, focus group meetings of crop producers will be conducted to define the issues more fully. Second, the output of these meetings will be used to design the needed economic model building and climate-agriculture analyses. Third, results from the first and second steps will be presented to reconvened focus groups for feedback concerning the initial model development and analyses. Next, based on the feedback, revisions to the modeling effort and climate-agriculture analyses will be undertaken. Finally, the modeling and analyses will be completed and results and decision-aids will be disseminated. Although written here as distinct steps, interactions with crop producers and ranchers will not be limited to the focus group meetings. Less formal interactions with crop producers are anticipated to occur throughout the study.

This approach involves strong integration of physical and social science research. It capitalizes on our 20-year record of collaborative experience that spans all areas of proposed activity – focus group use, climate-agriculture, economic model building and application, development of decision-aid tools and materials, and dissemination of such tools and materials to agricultural producers.

B. Objectives of Research Project

The general objective is to identify the potential to use substantial geographical separation of production areas as a risk management tool. Machinery and land contractual arrangements for production areas separated by substantial geographical distance will be the specific foci examined in pursuit of this general objective. Assessing the importance of climate variability within this risk management context also will be a major consideration.

C. Approach

The methodology being used to address the contractual arrangement problem is consisting of several related general steps. First, focus group meetings of crop producers will be conducted to define the issues in more detail. Second, the output of these meetings will be used to design the needed economic model building and climate-agriculture analyses. Third, results from the first and second steps will be presented to reconvened focus groups for feedback concerning the initial model development and analyses. Next, based on the feedback, revisions to the modeling effort and climate-agriculture analyses will be undertaken. Finally, the modeling and analyses will be completed and results and decision-aids will be disseminated. Although written here as distinct steps, interactions with crop producers will not be limited to the focus group meetings. Less formal interactions with crop producers are anticipated to occur throughout the study.

D. Matching Funds

None

II. INTERACTIONS

At this early stage of the research, the interactions have been limited to decision-makers who are being consulted as part of the study. Those interactions are summarized under "Accomplishments" below. It has not yet been appropriate to interact with the climate forecasting community or with other projects of the NOAA OGP Climate and Societal Interactions Division.

III. ACCOMPLISHMENTS

The successful initiation of the project has resulted in the following accomplishments:

(a) The extension of the unique Richman-Lamb set of daily precipitation totals and daily maximum and minimum temperatures for North America east of the Rocky Mountains was completed through 2000. This high density data set commences in 1949 and contains complete data for 776 evenly distributed (grid-like) stations with separations of about 110 km (65 miles). Station locations are shown in the figure below. The recent extension of the data set was for 1992-2000. The entire data set is being used in the preliminary analyses of climate variability now being performed for key agricultural production "windows" for six locations across North America. Those analyses are described below.

(b) Literature reviews have commenced in the several areas of relevance to the project. One thrust is identifying the most important articles in very large literature that deals with risk, diversification, and contractual issues. Also being reviewed is relevant work in the areas of agronomy, agronomic and economic model building and linkage, and climate-agriculture relations. More narrowly, information is being assembled on the costs of tillage and harvesting across the study region.

(c) To initiate the key involvement of members of the Association of Agricultural Production Executives (AAPEX) in the project, PI Peter Lamb participated in the AAPEX Annual Meeting in Cabo San Lucas, BCS, Mexico, during February 3-5, 2005. This meeting was organized and run by Co-PI Danny Klinefelter, in his capacity as AAPEX Executive Secretary. Dr. Klinefelter arranged for a special evening session during which Dr. Lamb outlined the project and made suggestions about how AAPEX members could be involved and for what mutual benefits. The session was well attended, by approximately 25 AAPEX members, and culminated with good interactions. As a result of those interactions, and further discussions over the subsequent two days, Drs. Klinefelter and Lamb reached agreements with six AAPEX members for their early participation in the project. Five of those members are scattered across southern Canada and the central and eastern United States, where they are involved in varied, large-scale agricultural production. These AAPEX members are as follows -- Carl R. Mattson (Chester, MT), Mark R. Lowe (Dalhart, TX), Patrick Duncanson (Mapleton, MN), Steven W. Twynstra (Alison Craig, ONT), and Allan L. Baucom (Monroe, NC). Each of these AAPEX members now has provided us with information on their key "production windows" and the weather and climate conditions during those windows they believe have the greatest impacts on their production. We have begun using the above Richman-Lamb data set to quantify the climate variability that has occurred during those production windows during the last half-century. In addition, we are using NOAA data for Washington State (not in the Richman-Lamb data set) to perform similar preliminary analyses in cooperation with a sixth AAPEX member (David Harlow, Palouse, WA). The locations of the farming operations of these six AAPEX members are shown in the figure below. The results of these preliminary climate-agriculture analyses will be shared with these AAPEX members, and used to elicit feedback from them. Those interactions will help guide our future interactions with these and other AAPEX members.

(d) The above climate-agriculture analyses are being performed by Mr. Reed Timmer, a Ph.D. candidate in the School of Meteorology at the University of Oklahoma. Mr. Timmer is one of the top meteorology Ph.D. students at Oklahoma, and his Dissertation will be derived from this project. He brings previous interdisciplinary collaborative experience to the project, as his M.S. research was on climate-energy relations and involved close collaboration with NOAA's National Climatic Data Center.

(e) The advantages and disadvantages of different climate-agriculture risk modeling approaches are being investigated by Mr. Ke Le, a Ph.D. student in the Department of Agricultural Economics at Texas A&M University. Mr. Le's dissertation also will be derived from this project.

IV. RELEVANCE TO THE FIELD OF HUMAN-ENVIRONMENTAL INTERACTIONS

This research is consistent with consistent with the NOAA-OGP-HDGCR Program's number (1) priority for FY04 funding, which involves a new focus on addressing *"how society can better adapt to climate variability and change"* (termed *"adaptation"*). In this regard, and as requested by the HDGCR Program Announcement Sheet FY 2004, our

focus is on "*regional to local scales*", on "*a particular sector*" (production agriculture), *"compare(s) across locales/regions where adequate baseline knowledge is available*", concentrates on "*analysis of decision making in the face of seasonal or year-to-year changes in climate*", and "*includes decision makers in all aspects of the research*". Accordingly, "*the results of this research should be able to provide decision makers within the regions under study information and/or tools to further existing strategies*", as required by the HDGRC Program.

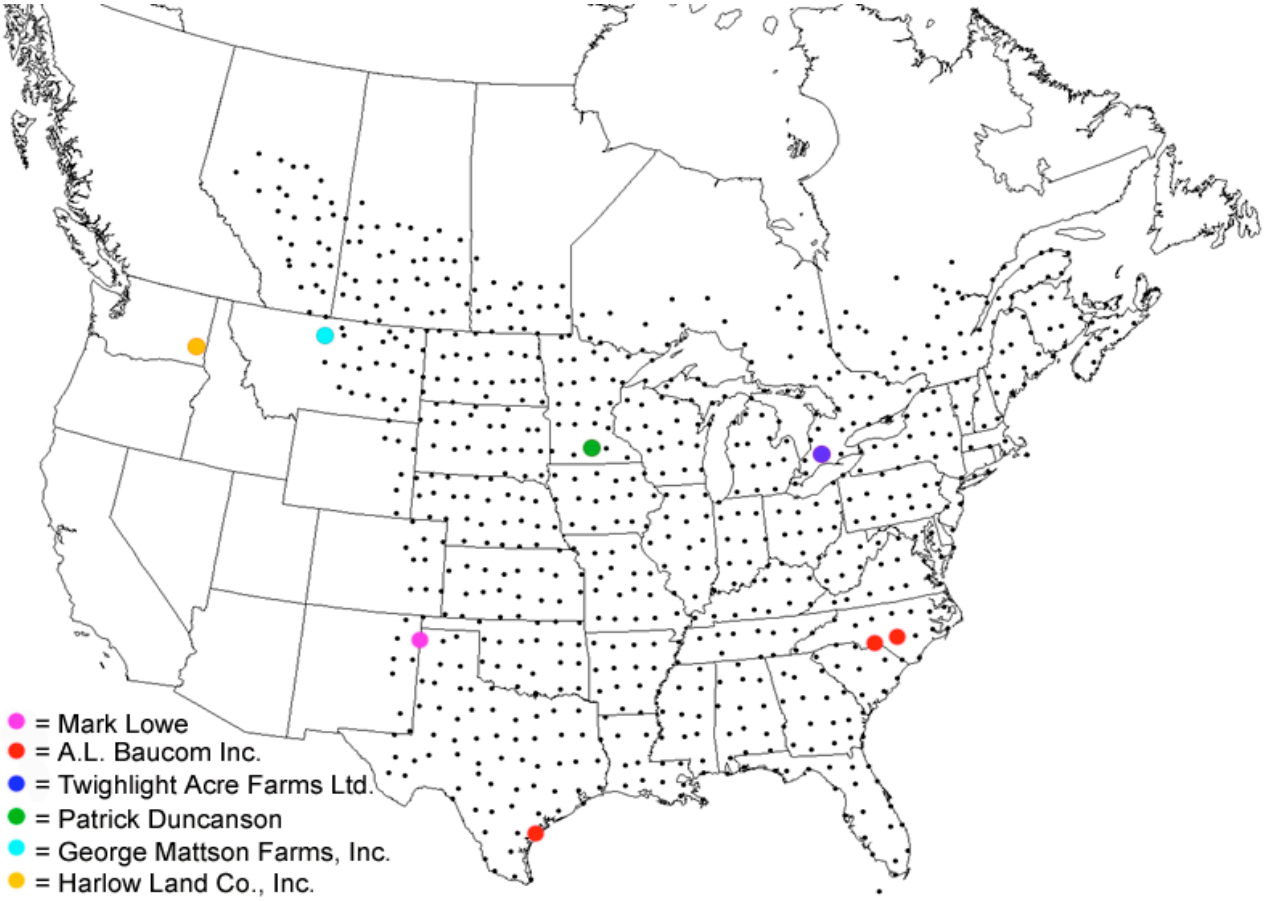
Although risk management by diversification is not a new topic, diversification through contractual arrangements for machinery and land by geographical location has not been studied thoroughly in the past. As noted above, the project combines climate analysis, agronomic and economic modeling, and interactions with large-scale agricultural producers. This methodological approach is consistent with the goals of the NOAA-OGP-HDGCR Program. Once the project is developed further, we will be able to provide more explicit information related to the areas listed in the guidelines.

V. Graphics

The attached map indicates the overall study domain and the climate stations in the aforementioned Richman-Lamb daily data set, for which preliminary climate-agriculture analyses are being performed in collaboration with the AAPEX members listed above.

VI. Website Address

Not yet established.



Small dots give locations of the stations in the Richman-Lamb daily precipitation and temperature data sets. Large colored-in circles locate the AAPEX farming operations for which preliminary climate-agriculture analyses have been initiated.